ABSTRACT OF THE INVENTION

Self-assembled monolayers and multilayer thin film structures were assembled from multiple components that were linked non-covalently by metal-ligand complexation. Non-covalently assembled multicomponent films assembly my the present method obviate problems associated with the covalent assembly of SAMs and multilayer thin film structures from large molecules. In one preferred embodiment, the disclosed film structures comprise2, 6 pyridinedicarboxylate ligands attached to an alkanethiol, which form a self-assembled monolayer on gold. The SAM is subsequently functionalized by sequential deposition of metal ions and ligands, allowing incorporation of one or more chromophores, photooxiding compounds or photoreducing to form multilayer film structures. Transition metals,lanthanide metals and other metals of varying charge may be employed in complexing with with 2, 6 pyridinedicarboxylate ligands to form stable ordered structures. The non-covalent assembly method provides for multilayer film formation from mixtures of metal ions and a varying number of film layers. Multilayer thin film structures exhibit stable cathodic photocurrent generation in the presence of methyl viologen or EDTA in solution.